

TANGRAM TREEMAPS

*An enclosure
geometrical
partitioning
method with
various
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Tangram Treemaps

*An enclosure geometrical partitioning
method with various shapes*

By

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CERTIFICATE OF AUTHORSHIP/ORIGINALITY

UNIVERSITY OF TECHNOLOGY SYDNEY

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CONTENTS

CONTENTS	iii
CONTENTS IN DETAILS.....	vi
FIGURE LIST	xi
TABLE LIST	xvii
EQUATION LIST	xviii
SYMBOL LIST	xix
ALGORITHMS LIST	xxi
ABSTRACT	xxii
CHAPTER 1. INTRODUCTION	1
SECTION 1.1 DATA VISUALIZATION	2
SECTION 1.2 GRAPH VISUALIZATION	9
SECTION 1.3 HIERARCHICAL VISUALIZATION	11
SECTION 1.4 ENCLOSURE APPROACH	15
SECTION 1.5 RESEARCH CHALLENGES	25
SECTION 1.6 RESEARCH OBJECTIVITIES.....	28
SECTION 1.7 OUR NEW APPROACH	29
SECTION 1.8 CONTRIBUTIONS.....	32
SECTION 1.9 THESIS ORGANIZATION	33

CHAPTER 2.TANGRAM TREEMAPS	36
SECTION 2.1 ORIGINAL IDEA	36
SECTION 2.2 FRAMEWORK.....	38
CHAPTER 3.TECHNIQUES AND ALGORITHMS.....	43
SECTION 3.1 TECHNIQUE SPECIFICATION	44
SECTION 3.2 IMPLEMENTATION ALGORITHMS	57
SECTION 3.3 TANGRAM TECHNIQUES.....	87
SECTION 3.4 SUMMARY	106
CHAPTER 4.INTERACTION MECHANISM.....	107
SECTION 4.1 INTERACTION MECHANISM.....	108
SECTION 4.2 INTERACTION METHODS.....	109
SECTION 4.3 CONCLUSION	116
CHAPTER 5.TECHNICAL EVALUATION	117
SECTION 5.1 COMPUTATIONAL COMPLEXITY	117
SECTION 5.2 ASPECT RATIO.....	124
SECTION 5.3 PROXIMITY OF NODE ORDERING	126
CHAPTER 6.USER STUDIES	129
SECTION 6.1 PRELIMINARY STUDY	130
SECTION 6.2 FORMAL USER STUDY.....	133
SECTION 6.3 EXTENDED USER STUDY	145

SECTION 6.4 SUMMARY	150
CHAPTER 7.CASE STUDY	151
SECTION 7.1 APPLICATION OVERVIEW	151
SECTION 7.2 CASE ONE –OVERVIEW AND FOCUS VIEW	157
SECTION 7.3 CASE TWO –HIGHLIGHTING INTERACTIONS	161
SECTION 7.4 CASE THREE – RECOMMENDATION OPTION	163
SECTION 7.5 CONCLUSION	164
CHAPTER 8.CONCLUSION AND FUTURE WORK.....	165
SECTION 8.1 REFLECTIONS ON THESIS QUESTIONS	165
SECTION 8.2 ANSWERS TO THESIS QUESTIONS	167
SECTION 8.3 FUTURE WORK	171
SECTION 8.4 FINAL CONCLUSIONS	174
PUBLICATION LIST	175
REFERENCES	175

CONTENTS IN DETAILS

Chapter 1. Introduction	1
Section 1.1 Data Visualization	2
1.1.1 The value of data	3
1.1.2 The relational structure of data	5
1.1.3 The behaviour of data	6
Section 1.2 Graph Visualization	9
Section 1.3 Hierarchical (Tree) Visualization	11
Section 1.4 Enclosure Approach	15
1.4.1 Slice & Dice Treemaps	16
1.4.2 Squarified Treemaps	17
1.4.3 Voronoi Treemaps	19
1.4.4 Space-Optimized Treemaps	21
1.4.5 Radial Edgeless Tree	23
1.4.6 Treemap Bar	24
Section 1.5 Research Challenges	25
1.5.1 Research Challenge one	25
1.5.2 Research Challenge Two	26

1.5.3	Research Challenge Three.....	27
Section 1.6	Research Objectivities	28
Section 1.7	Our New Approach.....	29
Section 1.8	Contributions.....	32
Section 1.9	Thesis Organization	33
Chapter 2.	Tangram Treemaps	36
Section 2.1	Original idea	36
Section 2.2	Framework	38
2.2.1	Idea evolution	38
2.2.2	Visualization Process pipeline.....	41
Chapter 3.	Techniques and Algorithms.....	43
Section 3.1	Technique specification.....	44
3.1.1	Technical convention	44
3.1.2	Basic Properties.....	45
3.1.3	Weight Calculation.....	46
3.1.4	Position of Nodes	47
3.1.5	Tessellation Methods.....	49
Section 3.2	Implementation Algorithms	57
3.2.1	D&C Triangular Approach	58
3.2.2	D&C Triangular Approach with Angular Resolution Constraint.....	69

3.2.3	Angular Polygonal Approach.....	79
3.2.4	D&C Rectangular Approach	83
Section 3.3	Tangram Techniques	87
3.3.1	Containment control.....	88
3.3.2	Container control	94
3.3.3	Extended container with Visual Properties	102
3.3.4	Container and Containment Control	105
Section 3.4	Summary	106
Chapter 4.	Interaction Mechanism	107
Section 4.1	Interaction Mechanism	108
Section 4.2	Interaction methods.....	109
4.2.1	Differentiation in Size	109
4.2.2	Differentiation in Shape	113
Section 4.3	Conclusion	116
Chapter 5.	Technical Evaluation.....	117
Section 5.1	Computational complexity	117
5.1.1	Computational Complexity of the Partitioning.....	118
5.1.2	Computational Time in DIFFERENT SHAPES	119
5.1.3	Computational Time Comparison with Other Techniques	121
Section 5.2	Aspect Ratio.....	124

Section 5.3 Proximity of Node Ordering	126
Chapter 6. User Studies.....	129
Section 6.1 Preliminary study	130
Section 6.2 Formal USER STUDY	133
6.2.1 Control Group	134
6.2.2 Hypothesis.....	134
6.2.3 Experiment and Design	135
6.2.4 Procedures and Apparatus	140
6.2.5 Performance results.....	141
6.2.6 User Preference and Feedback.....	143
6.2.7 Discussion of Results.....	143
Section 6.3 Extended user study.....	145
6.3.1 Experiments Hypothesis	145
6.3.2 Experiment and Design	146
6.3.3 Performance results.....	148
6.3.4 Discussion of Results.....	149
Section 6.4 Summary	150
Chapter 7. Case Study	151
Section 7.1 Application Overview	151
7.1.1 Boundary Gap	153

7.1.2	Colour and edge's thickness	155
7.1.3	Types of leaf nodes	155
Section 7.2	Case one –Overview and Focus view	157
Section 7.3	Case Two –Highlighting Interactions.....	161
Section 7.4	Case three – Recommendation option	163
Section 7.5	Conclusion	164
Chapter 8.	Conclusion and Future work	165
Section 8.1	Reflections on Thesis Questions	165
Section 8.2	Answers To Thesis Questions	167
8.2.1	Contribution 1 –Screen space Optimization	168
8.2.2	Contribution 2 – Visualization layout flexibility.....	169
8.2.3	Contribution 3 - Low computational complexity	170
Section 8.3	Future work	171
8.3.1	Technical improvements.....	171
8.3.2	Alignment with industry	172
8.3.3	Treemap Design Guidelines	173
8.3.4	Systematic Treemap Evaluation Principles.....	173
Section 8.4	Final Conclusions	174
References	175

FIGURE LIST

Figure 1-1 Data Visualization Research Scope & Structure -----	1
Figure 1-2 visualization example 1 of data value presented in 2D space -----	3
Figure 1-3 visualization example 2 of data value presented in 2D space -----	3
Figure 1-4 visualization example of data value presented in 3D space -----	4
Figure 1-5 The visualization example of data values presented in a High Dimensional space using Parallel Coordinates -----	4
Figure 1-6 The visualization example of data relational structure in 2D -----	5
Figure 1-7 The visualization example of data relational structure in 3D -----	6
Figure 1-8 The visualization example of data behaviour-----	7
Figure 1-9 The visualization example of data transaction patterns -----	7
Figure 1-10 An example of Force-Directed drawing of graphs -----	10
Figure 1-11 An example of the Sugiyama drawing of graphs -----	10
Figure 1-12 An example of orthogonal drawing of graphs -----	10
Figure 1-13 An example of symmetric drawing of graphs -----	10
Figure 1-14 An example of radial drawing of graphs-----	10
Figure 1-15 An example of classical hierarchical drawing -----	12
Figure 1-16 An example of the radial tree drawing -----	13
Figure 1-17 An example of balloon tree drawing-----	13

Figure 1-18 An example of Hyperbolic Tree drawing -----	14
Figure 1-19 Slice and Dice illustration -----	17
Figure 1-20 Squarified treemaps illustration-----	18
Figure 1-21 Voronoi Treemap illustration -----	19
Figure 1-22 Space –Optimized treemaps illustration -----	21
Figure 1-23 Radial Edgeless Tree illustration-----	23
Figure 1-24 TreemapBar illustration-----	24
Figure 1-25 Research Challenge illustration -----	25
Figure 1-26 Our new approach illustration 1 -----	29
Figure 1-27 Our new approach illustration 2 -----	30
Figure 2-1 Tangram illustration 1-----	37
Figure 2-2 Tangram illustration 2-----	37
Figure 2-3 The concept map of Tangram Treemap’s idea evolution -----	39
Figure 2-4: Flow chart of visualization process pipeline for Tangram Treemap -----	42
Figure 3-1 Position of nodes illustration -----	48
Figure 3-2 Tessellation Illustration of linear and Divide and Conquer methods -----	50
Figure 3-3 Tessellation Methods Comparison 1-----	53
Figure 3-4 Tessellation Methods Comparison 2-----	54
Figure 3-5 First Cutting Illustration of implementation algorithms-----	57
Figure 3-6 An illustration for a small data using implementation algorithms-----	58

Figure 3-7 Subdivision partitioning process using D&C Triangular algorithm -----	59
Figure 3-8 A visualization using D&C Triangular algorithm on a hexagon-----	67
Figure 3-9 A visualization using D&C Triangular algorithm on a concave polygon -----	67
Figure 3-10 A visualization using D&C Triangular algorithm on a concave polygon -----	68
Figure 3-11 A visualization using D&C Triangular algorithm on an octagon -----	68
Figure 3-12 A visualization using the D&C Triangular algorithm with angular resolution constraint on a hexagon-----	72
Figure 3-13 A visualization using the D&C Triangular algorithm with angular resolution constraint on a concave polygon -----	72
Figure 3-14 A visualization using the D&C Triangular algorithm with angular resolution constraint on a concave polygon -----	73
Figure 3-15 The partitioning of a data set with 272 vertices using a) D&C Triangular algorithm and b) D&C Triangular algorithm with angular resolution constraint. -----	74
Figure 3-16 a visualization using the D&C Triangular algorithm on a hexagon for a file- system with approximately 16,600 vertices and 10 levels -----	75
Figure 3-17 Layout results with angular resolution constraint Improvement overview -	78
Figure 3-18: Angular Polygonal partitioning process output illustration -----	80
Figure 3-19 Experimental results of Angular Polygonal Treemap-----	82
Figure 3-20 D&C Rectangular partitioning process output illustration -----	83
Figure 3-21 D&C Rectangular Treemap experimental result in Rectangular container --	85
Figure 3-22 D&C Rectangular Treemap experimental result in triangular container-----	85
Figure 3-23 D&C Rectangular Treemap experimental result in polygon container -----	86

Figure 3-24 Containment control with one focus illustration 1 -----	88
Figure 3-25 Containment control with one focus illustration 2 -----	89
Figure 3-26 Containment control with one focus illustration 3 -----	89
Figure 3-27 Containment control with two focus illustration 1 -----	90
Figure 3-28 Containment control with one focus illustration 2 -----	91
Figure 3-29 Containment control with two focus illustration 3 -----	91
Figure 3-30 Containment control with two focus illustration 4 -----	92
Figure 3-31 Containment control with three focus illustration-----	93
Figure 3-32 An example of a visualization using an angular polygonal algorithm on sub- structures with various partitioning angles -----	93
Figure 3-33 Triangle container illustration -----	94
Figure -34 Hexagon container illustration -----	95
Figure 3-35 A visualization using the D&C Triangular algorithm with angular resolution constraint on a pie shape -----	97
Figure 3-36 A visualization using the D&C Triangular algorithm with angular resolution constraint on a ribbon shape-----	97
Figure 3-37 A visualization using the D&C Triangular algorithm with angular resolution constraint on an ellipse-----	98
Figure 3-38 Visualizations using the D&C Triangular algorithm with angular resolution constraint approximately 1000 nodes -----	99
Figure 3-39 A visualization using the D&C Triangular algorithm with angular resolution constraint on a “coin” (uniform data)-----	100

Figure 3-40 A visualization using the D&C Triangular algorithm with angular resolution constraint on a “coin”(non-uniform data)-----	101
Figure 3-41 an extended example of angular polygonal treemap in a pie convex container-----	102
Figure 3-42 an extended example of angular polygonal treemap in a ribbon shaped container-----	103
Figure 3-43 an extended example of Triangular Treemap in a book-shaped concave container-----	103
Figure 3-44 an extended example of Triangular Treemap visualizing a larger dataset in axe shaped concave container. -----	104
Figure 3-45 Container and containment control illustration-----	105
Figure 4-1 The concept map of Interaction control for Tangram Treemaps-----	109
Figure 4-2 The Interaction method 1 -----	111
Figure 4-3 The Interaction method 2 -----	112
Figure 4-4 Interaction process illustration -----	115
Figure 5-1 Compared treemaps technique illustration-----	123
Figure 6-1 Preliminary study sample -----	131
Figure 6-2 Preliminary study results -----	133
Figure 6-3 Illustrations of the first user study experiment -----	136
Figure 6-4 Illustrations of the second user study experiment for size distinguishing ---	138
Figure 6-5 Illustration of experiments in the third user study -----	139
Figure 6-6 First user study’s performance results -----	142

Figure 6-7 Questionnaire example in third user study	147
Figure 7-1 Application demonstration of file systems overview with boundary gaps feature.....	152
Figure 7-2 Overview illustration with boundary gap.....	154
Figure 7-3 Overview illustration with colour visual feature	156
Figure 7-4 Case study 1-a.....	158
Figure 7-5 Case study 1-b	159
Figure 7-6 Case study 1-c.....	160
Figure 7-7 Case study 2	162
Figure 7-8 Case study 3	164

TABLE LIST

Table 3-1 Angle aspect ratio of polygons (triangles) using D&C Triangular Algorithm and D&C Triangular with angle Resolution constraint.	77
Table 5-1 The computational time (in milliseconds) of our Tangram algorithm and the Tangram with angular resolution constraint on a variety of data sets and shapes of the container	120
Table 5-2 The computational time (in milliseconds) of the Tangram and the Angular Resolution Constraint algorithms in comparison of Slice-and-Dice Treemaps, Squarified Treemaps, and Space-Optimised Tree on various data sets using the same rectangular container.	122
Table 5-3 Average aspect ratios of layouts	125
Table 5-4 Average distance of proximity	127

EQUATION LIST

Equation 1: Node weight calculation formula -----	46
Equation 2: Position of nodes calculation formula -----	47
Equation 3: Polygon's signed area calculation formula-----	47
Equation 4: Partitioning time complexity formula-----	118
Equation 5: Distance between two nodes formula-----	126

SYMBOL LIST

R^2 : represents a two-dimensional plane in Euclidean geometry;

S: represents a subset of Euclidean space R^2 is compact if and only if it is closed and bounded.

N: indicates a node is the fundamental unit of which graphs are formed in graph theory. A subset of Nodes are presented by n_1, n_2, \dots, n_m , such as $N = \{n_1, n_2, \dots, n_i, \dots, n_j, \dots, n_m\}$. **m** indicates the Number of Values; **i, j** indicates the Number of Values.

P: a Polygon bounded by a closed path in a geometry shape. We map Node in tree structure into Polygon representation, e.g. for example, For the Node **N** is transferred as a Polygon **P (N)**

ℓ : Straight line segments which the polygon composed of. For example, a finite sequence of **L**: $= \{ \ell(v_1, v_2), \dots, \ell(v_{n-1}, v_n) \}$. **$\ell(v_{e-1}, v_e)$** : present The longest side.

V: In the polygon represents the points where two edges meet are the polygon's vertices. A set of vertices which a polygon composed of, are presented in a set of **V**: $= \{v_1, v_2, \dots, v_i, \dots, v_j, \dots, v_n\}$,

v_s Initial vertex and **$v_{s'}$** which is the point **v_s** transferred to the side after partitioning happened; **v_c** which is cutting vertex and **$v_{c'}$** which is the point **v_s** transferred to the side after partitioning happened,

A: The Area size of polygon. The area size of a polygon equals the area size of a set of sub-polygons **A**: $= \{a_1, a_2, \dots, a_i, \dots, a_j, \dots, a_n\}$.

W: A weight of a value associated with the property of a vertex. e.g., **W**: $= \{w_1, w_2, \dots, w_i, \dots, w_j, \dots, w_n\}$. **W_{g1}, W_{g2}** present subgroups of **W**, e.g., **W**: $= \{W_{g1}, W_{g2}\}$;

Θ : an interior angle formed by two sides of a polygon that share an endpoint. $\theta = \{ \theta_1, \theta_2, \dots, \theta_i, \dots, \theta_j, \dots, \theta_n \}$; θ_{\min} defines Minimum Angular resolution Constraint; α : partition angle

ALGORITHMS LIST

Algorithm: LinearPartition()	51
Algorithm: D&C Partition ()	60
Algorithm: Ini FirstPoint(vs, P(N))	61
Algorithm: Divide()	63
Algorithm: Conquer()	64
Algorithm: Angular Resolution Constraint()	69
Algorithm: AngularDivide()	80

ABSTRACT

In practices, analysts need to monitor multiple views and real time processes in one physical screen simultaneously regularly, due to the time demands or multi-task requirements. More often the visualization tool shares the screen space with other concurrent projects or process sessions. Although the traditional enclosure (or space-filling) tree approach can guarantee the maximization of space utilization in an isolated session display (that commonly occupies a single rectangular geometrical area), they however do not consider the maximization of display utilization of the whole computer screen, where a number of concurrent sessions are running in one screen.

This thesis proposes a new enclosure visualization method, named Tangram Treemaps that achieves the maximization of the computer screen utilization through the flexibility of display (or container) shapes. Breaking through the limitation of rectangular constraint, the new approach is able to partition various polygonal shapes. Furthermore, our algorithms also improve the efficiency of interactive tree visualization significantly, through the reduction of the computational cost.

Finally, we provide three case studies to demonstrate the commercial value of our method by using different datasets; we evaluate the method according to graph drawing and perceptual guidelines to show the advantage in scientific measurements; we conduct three user studies to compare the performance of our method with the traditional treemaps. Research results have proven that Tangram Treemaps could be adopted into a wider range of applications, taken in account its real-time performance and the quality of the visualization layouts.